year of age. Infants who were wasted in the first wet season of their life were more likely to be wasted in their second wet season, even after controlling for recovering during the intervening dry season (OR:3.2; 95% CI:2.3, 4.4).

Infants born at the start of the annual wet season (July–October) showed early growth faltering in WLZ, putting them at increased risk of subsequent stunting. Time-lagged observations show that being wasted was predictive of stunting (OR: 3.2; 95% CI: 2.7, 3.9), even after accounting for current stunting. The reverse also holds: children currently stunted are 1.5 times more likely to be wasted three months later, even after accounting for currently wasting status. Boys were more likely to be wasted, stunted, and concurrently wasted and stunted than girls, as well as being more susceptible to seasonally-driven growth deficits.

This analysis highlights several key issues of relevance to our understanding of the relationship between wasting and stunting in early childhood. First, in this highly seasonal, rural environment with high rates of exclusive breastfeeding, there is a seasonally-driven risk among young infants of poor growth. This indicates the need to provide more targeted support to breastfeeding mothers and increase attention to infant feeding during periods of seasonal stress. Second, results demonstrate that being wasted leads to increased risk of subsequent stunting. This suggests that stunting is in part a biological response to previous episodes of being wasted and that stunting may represent a deleterious form of adaptation to more overt undernutrition (wasting). Stunted children are not just short, but are children who were earlier more seriously malnourished and who are survivors of a composite process. Third, children who are wasted in one wet season are more likely to be wasted in a subsequent wet season even after recovery, suggesting a continued vulnerability across seasons. Further understanding is needed of related physiologic mechanisms and environmental factors. Fourth, and consistent with much of the global literature, boys are more likely to be wasted or stunted or to have concurrent wasting and stunting; all of which convey added risk of mortality. There is a need to understand this gender difference in vulnerability so that the policy and practice communities can take this into account.

Results indicate that, where there are levels of wasting and stunting of public health significance in a given context, there are compelling reasons for both treatment and prevention interventions to consider wasting and stunting jointly and with awareness of the relation between them. The separation of the wasted infant/child and the stunted infant/child in terms of policies, programmes and research risks opportunities being missed to detect and intervene to prevent both forms of undernutrition in this highly-vulnerable population group. The attainment of World Health Assembly and other global targets remains a very strong global and country-level intent, but these targets will not be achieved where approaches to infant and child undernutrition remain siloed.

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Scurvy outbreak among South Sudanese adolescents and young men – Kakuma refugee camp, Kenya, 2017-2018

Summary of research[1]

WFP/Rein Skullerud

Refugees wait while food is being prepared in the kitchen of Kakuma refugee camp reception center

Location: *Kenya*

What we know: Refugee populations dependent on food assistance are at risk of micronutrient deficiencies.

What this article adds: An outbreak of scurvy among 45 adolescent and young adult male South Sudanese refugees suspected cases was confirmed by Centers for Disease Control and Prevention (CDC) in 2018. Those affected had been provided a partial food ration consisting of cereal, pulses, fortified corn-soy blend (CSB+) and vitamin A-fortified oil, plus electronic cash to support dietary diversification to supplement their diets in Kakuma refugee camp, Kenya between 2017 and 2018. From 2015, there were shortages of food assistance commodities and funding shortfalls. Rather than purchasing fresh foods rich in vitamin C, the investigation found those affected selected more calorie-dense cereal and pulses to supplement the energy-deficient food ration. Symptoms resolved after vitamin C treatment. Vitamin C retention of CSB+ after preparation was <16%; insufficient to prevent scurvy. Findings show that food and cash assistance based on average household composition is insufficient for refugees with higher caloric needs; in this instance, adolescents and young adult male refugees.

Background

Scurvy is a relatively rare micronutrient-deficiency disease that can occur among refugees dependent on food assistance due to inadequate access to fresh fruits and vegetables. Kakuma refugee camp in Kenya's Turkana district is home to 148,000 refugees, mostly from Somalia and South Sudan, who receive food assistance. In August 2017, a number of South Sudanese adolescent and young adult male refugees were evaluated for calf pain, chest pain and gingival (gum) swelling. No diagnosis was initially made due to non-specific symptoms and some patients received antibiotics and analgesics. All were managed as outpatients, but

[1] Ververs, M., Wambugu Muriithi, J., Burton, A., Wagacha Burton, J., Oman Lawi, A. (2019). Scurvy outbreak among South Sudanese adolescents and young men – Kakuma refugee camp, Kenya, 2017-2018. Morbidity and Mortality Weekly Report (MMWR) US Department of Health and Human Services/Centers for Disease Control and Prevention, January 25, 2019. Vol. 68/ No. 3.

symptoms did not improve. During subsequent months, more young men reported similar symptoms. On 20 January 2018, the United Nations High Commissioner for Refugees (UNHCR) was informed and conducted clinical examinations. Signs and symptoms included lower limb pain and swelling, lethargy, fatigue, gingival swelling and pain, hyperkeratotic skin changes and chest pain. Based on these clinical findings, an outbreak of micronutrient deficiency, particularly vitamin C deficiency (scurvy) was suspected. Vitamin C treatment was given to those affected and, in February 2018, UNHCR requested assistance from Centers for Disease Control and Prevention (CDC) to carry out an investigation. This article summarises the findings.

Investigation and findings

Two health specialists from CDC and UNHCR conducted an outbreak investigation from 11 to 17 March 2018. A suspected scurvy case was defined as the occurrence of lower limb, knee joint or ankle swelling, and at least two of the fol¬lowing: calf pain, shin pain, knee-joint pain, or gingivitis in a person of any age. Because the South Sudanese frequently have very dark skin, the typical dermato¬logic symptom of petechial haemorrhage was not included in the case definition. Forty-five patients with suspected scurvy were identified and interviewed using a questionnaire developed by investi¬gators to obtain information on symptoms and diet, with a recall period of six months. For a subset of 14 patients, the age structure of the household was analysed. Additional interviews were conducted with staff members from UNHCR, World Food Programme (WFP), the non-governmental organisation responsible for healthcare in the camp, community health volunteers, community leaders and food-shop owners who interacted with the patients. Dietary intake was estimated using WFP's information on provided food rations and NutVal 4.1, a free software programme for calculating the nutritional content of food rations.[2]

At the time of this investigation, all refugees in Kakuma received food assistance, consisting of cereal, pulses, fortified corn-soy blend (CSB+) and vitamin A-fortified oil. By WFP standards, a food ration should provide 2,100 kcal per person per day (pppd) but, after 2015, a part of the cereal compo¬nent of the ration was replaced by electronic cash (e-cash) to provide dietary diversification and choice. In 2017 and 2018, one-person households received a 500 Kenyan Shillings (KSh)/pppd and food ration of 900-1,400 kcal/pppd. Households of ≥2 persons received 300 KSh/pppd and a food ration of 900-1,700 kcal/pppd. The variations in the food assistance from 2015 onwards resulted from shortages of commodities and funding shortfalls. Among the 45 patients with suspected scurvy, date of symptom onset was known for 44. Among these, 29 (66%) reported onset between August and November 2017.

All 45 patients with suspected scurvy were adolescent and young adult male refugees from South Sudan who had arrived in Kakuma between 2012 and 2017; 33 (73%) had arrived in 2014 or later. The median age was 19 years (range = 12-32 years). Approximately 58% of patients reported swelling of the lower limb, 53% ankle swelling, and 42% lower-limb pain. Interviews with health personnel and patients found that approximately seven to 10 patients had been unable to walk. Forty of the 45 patients with suspected scurvy were treated with vitamin C. The median household size of patients with suspected scurvy was five persons (range = one to 15 persons). Among the subset of 14 households for which age was collected, nine (64.3%) included only adolescents and young men aged 13-22 years; only five households included a female, only one of whom was an adult.

All patients with suspected scurvy reported that they ate one meal per day. None had income from work or received any remittances and all reported that, rather than using the e-cash to diversify their diets, they used the full e-cash amount to purchase staple foods (e.g., cereals and pulses) and sometimes salt. Forty-three patients (96%) reported that they had not purchased vegetables, fruits or potatoes since their arrival in Kakuma and used the e-cash to supplement their diet with cereals and pulses, which provided an additional 870-1,450 kcal/pppd. All patients who received treatment with vitamin C noted improvement of symptoms within less than one week, particularly reduc¬tion in swelling of knee and ankle joints and shin pain. All patients who previously had been unable to walk were able to do so after treatment.

In response to this outbreak, in April 2018 WFP tested the amount of vitamin C in CSB+ after simulating the CSB+ preparation in a laboratory setting. The raw product contains 90 mg vitamin C per 100g, and each refugee received 40g CSB+ per day (equivalent to 36 mg vitamin C per day). The cooking simulation demonstrated that vitamin C retention after preparation was <16%; thus, intake through consump¬tion would be <6 mg vitamin C per day, which is insufficient to prevent deficiency.

Discussion

Scurvy is not new to refugee settings in which a limited amount of fresh foods is available or affordable and has previously been documented in Kakuma refugee camp, with outbreaks reported during 1995-1997 (Verdirame and Harrell-Bond, 2005) and 2003 (UNHCR, 2003). Vitamin C defi¬ciency has also been described among refugees and imprisoned male populations in similar geographic areas (Desenclos et al, 1989; Seaman and Rivers, 1989; Bennett and Coninx, 2002). The energy requirements for males aged 14-18 years and 18-30 years are 3,000-3,400 kcal per day and 2,550-3,900 kcal per day, respectively (FAO/WHO/UNU, 2001), based on moderate physical activ¬ity (males aged 14-18 years) and active-to-moderately-active physical activity (men aged 18-30 years). The food ration provided in the camp supplied 900-1,700 kcal/pppd; if all e-cash was used to purchase sorghum and split peas, an additional 870-1,450 kcal/pppd was potentially available, for a maximum theoretical intake of 1,800-2,900 kcal/pppd, depending on household size. Thus, the food ration met only half of the required caloric needs. Because the e-cash intended for dietary diversification was not used to purchase fresh foods, such as vitamin C-rich fruits and vegetables, but rather to comple¬ment the food rations with more calorie-dense and cheaper staple foods to secure the missing calories, vitamin C deficiency resulted. The diet of patients with suspected scurvy contained, on average, <10 mg vitamin C per day; the minimum daily requirement to prevent scurvy is 10 mg (WHO, 1999). Despite previous assumptions, the fortified commodity, CSB+, was not a sufficient source of vitamin C as losses during preparation were much higher than initially estimated. The geographic clustering of suspected cases likely resulted from the relatively higher number of young men living and cooking together in one area of the camp and sharing their limited food rations and e-cash.

Provision of food assistance in refugee settings is often based on average household composition, factoring in age, sex and caloric needs. In this investigation, the adolescent and young males had very high nutritional needs compared with persons in an average household. These differences in household demographics demonstrate that simply providing an average amount of calories calculated on assumed household demo¬graphics is inadequate to meet nutritional requirements. In addition to food rations, refugees were provided with e-cash to purchase their own food to add diversity and choice to their diet. However, this investigation indicated that for adolescent and young adult male refugees, both forms of assistance were inadequate to allow access to sufficient calories and the dietary diversification needed for intake of sufficient micronutrients, such as vitamin C. It is important to consider these needs when determining the amount of food or cash assistance provided to adolescents and young adult male refugees.

[2] www.nutval.net

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